ASSESSMENT OF THE SPECTRUM OF ACTIVITY OF A NEW INSECTICIDE BASED ON *CLITORIA TERNATEA* EXTRACT

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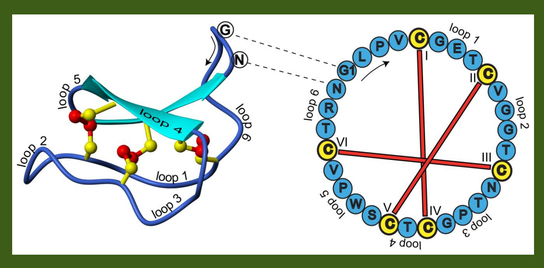
Clitoria ternatea L. (butterfly pea) Fabaceae family

- Pharmacological properties
- Excellent forage legume (very good regrowth and yields)
- Cover crop
- Edible plant (young and tender parts of the plant, shoots, leaves, flowers and pods)

Recent studies indicate that *C. ternatea* has insecticidal effects (cyclotides and flavonoids)

Cyclotides: molecules composed of 28-37 amino acids in a head-to-tail cyclic backbone with three interlocking disulfide cystine bonds), mainly produced by plants as defence proteins



The aim was to explore the possible use of *C. ternatea* extracts against a wide range of phytophagous insects

Materials and methods

- Small scale trials under controlled conditions (lab, greenhouse)
- Concentration of the active ingredient in the formulated product: 400 g/l
- Dosage of the formulated product: 20 ml/l
- Untreated control (UTC): water
- Chemical standard reference (names and dosages, Table 1)
- Experiment carried out at least twice with 5 replicates/treatment
- Data of the experiments were pooled
- Statistics: ANOVA, Tukey's test (α = 0.05)

Target	Reference Product 1		Reference Product 2		Reference Product 3	
	Active Ingredient	Dosage (ml or g/l)	Active Ingredient	Dosage (ml or g/l)	Active Ingredient	Dosage (ml or g/l)
Aphis gossypii	Flonicamid	0,14				
Antispila oinophylla	Acetamiprid	2,00				
Drosophila suzukii	Spinosad	0,20	Deltamethrin	0,70		
Frankliniella occidentalis	Abamectine	0,75				
Halyomorpha halys	Acetamiprid	2,00	Clorantraniliprole	0,18	Chlorpyrifos-Methyl	4,00
Lobesia botrana	Emamectine Benzoate	1,50				
Scaphoideus titanus	Flonicamid	0,14				
Trialeurodes vaporariorum	Abamectine	0,13				

Table 1. Target pests and chemical standard references and related dosages


Aphis gossypii


Antispila oinophylla


Trialeurodes vaporariorum


Scaphoideus titanus


Lobesia botrana

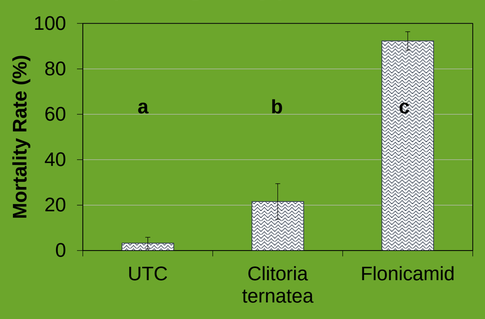

Frankliniella occidentalis


Halyomorpha halys


Drosophila suzukii

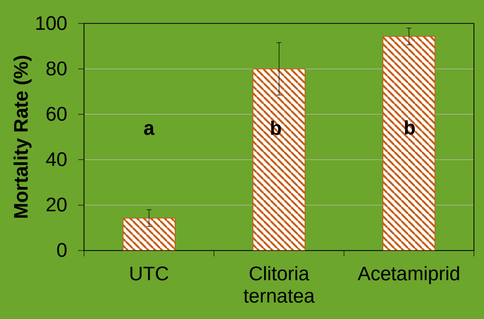
Results

Aphis gossypii



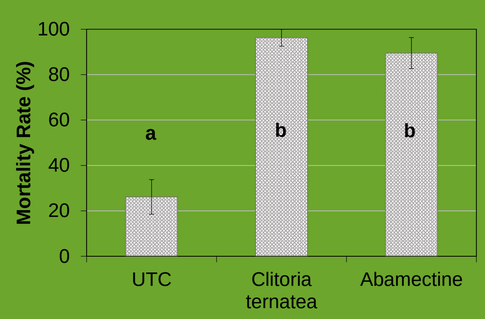
Mortality of *A. gossypii* nymphs, 4 days after the treatment. Treatments were carried out on insects placed on zucchini leaf disk in Petri dishes

Antispila oinophylla



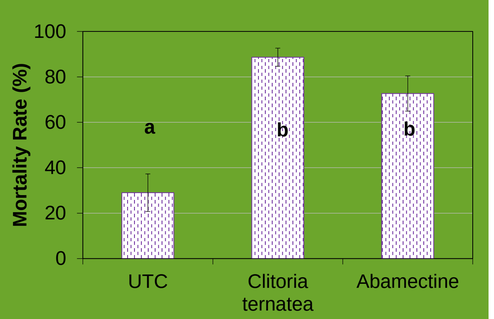
Mortality of *A. oinophylla* larvae, 40 hours after the treatment. Treatments (drops) were applied on leaves, above the mines containing active *A. oinophylla* larvae inside, and incubated in Petri dishes

Trialeurodes vaporariorum



Mortality of *T. vaporariorum* nymphs, recorded as the number of specimens that did not emerge from the pupa in the three weeks following the treatment. Treatments were carried out on tobacco leaf disks infested by nymphs

Frankliniella occidentalis



Mortality of *F. occidentalis* nymphs, 48 hours after the treatment. Treatments were carried out on insects placed on bean leaf disk and then incubated in Petri dishes

Lobesia botrana

Mortality of *L. botrana* larvae, 7 days after the treatment. Larvae were placed on treated berries an incubated in Falcon tubes

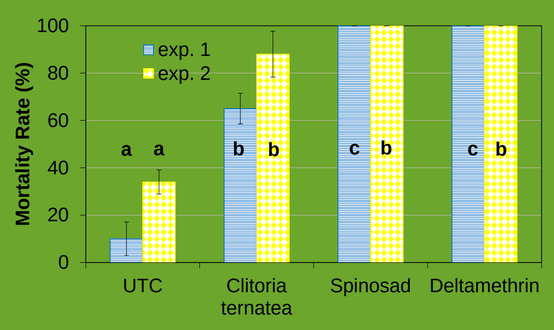
Scaphoideus titanus

Mortality of *S. titanus* nymphs, 7 days after the treatment. Treatments were carried out on grapevine leaf disks, insects were then placed on the leaf disks and incubated in Petri dishes

Halyomorpha halys

Mortality of *H. halys* adults up to 14 days after the treatment. Treatments were carried out on crabapples, insects were then placed on the apples and incubated in boxes

Drosophila suzukii



Mortality of *D. suzukii* adults 48 hours after the treatment. Treatments were sprayed directly on insects, which were then incubated in Petri dishes; some variability in the efficacy between trials (exp1 and 2) was noticed

UTC = untreated control (water)

Different letters indicate that values are significantly different (ANOVA $p < 0.05$, Tukey HSD test, $\alpha = 0.05$)

Discussion

- Good efficacy against thrips and whiteflies (also confirmed by field trials)
- Promising results against some other species (poor results with some others)
- Based on the nature of the extract (no toxicity for humans and environment) the *C. ternatea* extract can be considered a new low-risk tool to be used in the integrated pest management of crops against some specific targets

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